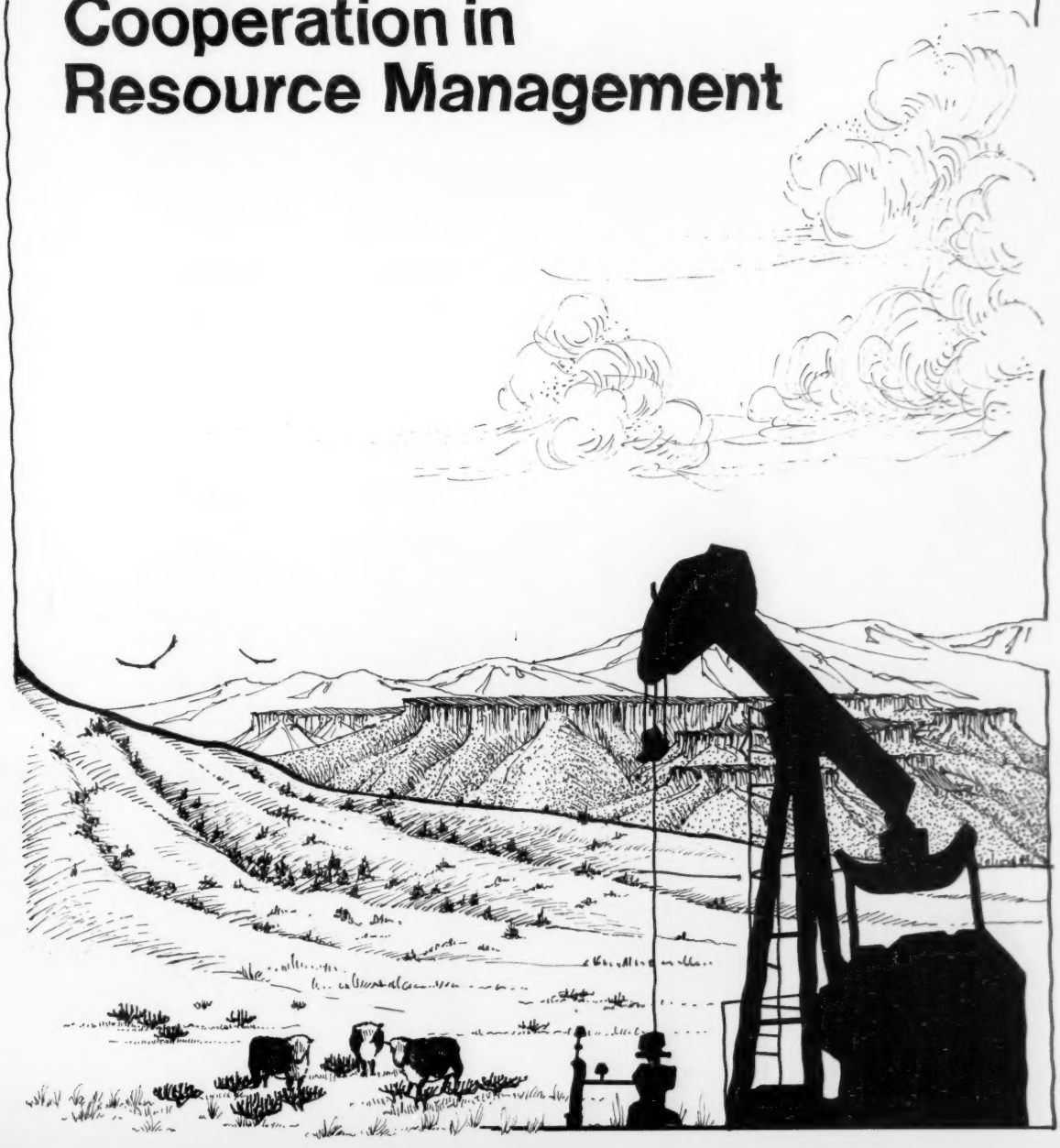
Your Public Lands

Winter 1984

Cooperation in Resource Management



Your Public Lands

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UNITED STATES
DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

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Resource Management Plans

By David C. Williams

Where should we lease coal?

What areas should we recommend for wilderness?

Which lands should we retain and which might be suitable for disposal?

And how should we allocate forage among cattle and sheep?

Since its creation in 1946, the Bureau of Land Management (BLM) has been making decisions to answer questions like these that affect the management of public land resources for which BLM is responsible. Where these were once "the lands nobody wanted," now there are many demands for them, and that leads to conflicts and issues. The Federal Land Policy and Management Act of 1976 (FLPMA) requires public land uses to be determined by resource management planning.

We are starting to see the results of this multiple use planning process. The first Resource Management Plan (RMP) has been completed for the Glenwood Springs (Colorado) Resource Area—and 50 more are underway. The RMP process demonstrates several themes:

Plans are action oriented; they are designed to help managers make decisions.

Plans are prepared only when issues or unresolved questions are evident. The most common issues relate to grazing, wilderness, coal leasing and land disposal.

While "issue-driven," the process results in a plan covering all the resources in one BLM resource area. (In the Eastern States, BLM does similar planning on a statewide basis.)

The process is fully integrated with the National Environmental Policy Act (NEPA) process. Environmental impact statements are combined with resource management plans.

The plan includes a narrative and maps showing allocations of the kinds and locations of allowable uses, levels of use, and management actions to be taken. For example, the RMP may designate areas for grazing, wilderness, timber harvest, mining, wildlife habitat, and other uses, either singly or in combination; determine suitability for leasing; indicate levels of use; designate areas of critical environmental concern; and show lands which might be considered for disposal.

Resource management plans are followed by appropriate, specific activity plans, such as a wildlife habitat management plan or a coal tract delineation.

The Bureau started six pilot RMPs in 1980. Experience gained there and during previous planning is being shared in preparing plans for BLM's 154 resource areas in 55 districts, plus several statewide plans. This experience, along with new, streamlined planning regulations issued July 5, 1983, is enabling the Bureau to cut both time and cost without sacrificing quality. A contributing factor is increased reliance on existing data but with more emphasis on monitoring changes in resources.

Public involvement is a key to the development of individual resource management plans and to the success of the entire planning process. Resource area managers develop resource management plans for their areas with the

BLM photo by Cindy McKee

Colorado ranchers discuss allocation of resource uses and rangeland improvements with BLM representatives.

concurrence of State Directors.

How can the public get involved? There are five principal times in the BLM planning process when opportunities are best for public participation:

1. At the beginning, in the scoping process, to help identify issues. A "Notice of Intent" in the Federal Register starts the process. At this point, it's important for interested persons to get on the RMP mailing list by contacting the area office, to get notices of meetings and other information. Some resource areas produce a regular newsletter on the progress of planning.

2. When planning criteria are reviewed, which is when the manager lays out the ground rules to guide the planning process.

3. At the time the draft Resource Management Plan/Environmental Impact Statement is issued for review and comment. BLM provides at least 90 days for the public to comment on the document and suggest changes or new alternatives.

4. When the proposed final plan is issued. Under the new planning regulations, issued in July, 1983, an opportunity is provided for the state governor to review the final proposal for consistency with officially approved state, local and Indian Tribe plans, policies and procedures.

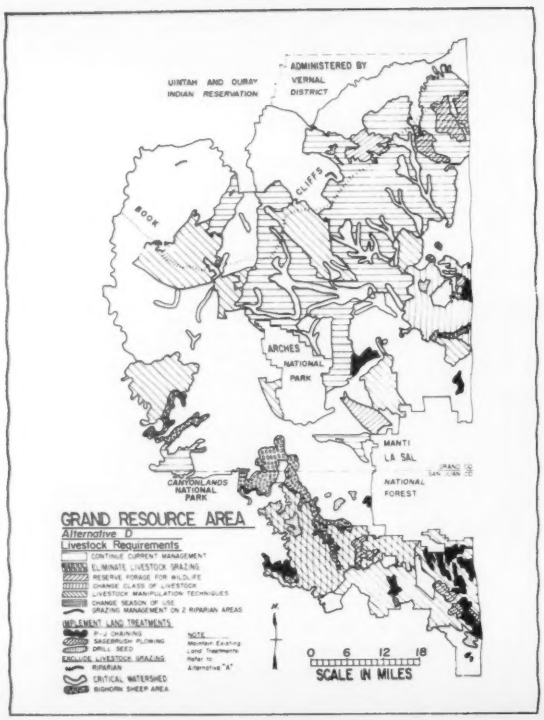
5. Finally, any person who has participated in the planning process and who may be adversely affected by the planning decision may protest the plan's approval to the BLM national Director.

BLM has just published a 24-page brochure, available from any BLM office called a "Guide to Resource Management Planning in BLM." It stresses points at which the public may contribute to success of the effort.

A similar process is followed when amending existing plans, which currently cover about four-fifths of the land (outside Alaska) that BLM manages.

Once a plan is adopted, all BLM resource management decisions conform to it. Resource management plans provide the basis for taking action; they help BLM managers make decisions that are effective and responsive in managing the resources of the lands for which they are responsible. ▽

People discuss resource management alternatives, share knowledge, and offer judgment based on experience during public meetings to develop sound and fair Resource Management Plans.



One of a series of maps that delineates proposed combinations of land uses and treatments under one of several alternatives during the development of a Resource Management Plan.

David C. Williams is the Chief, Office of Planning and Environmental Coordination, Bureau of Land Management, Washington, D.C.

Cooperative Management Agreements

By Charlotte Yarrington-Ball

Cooperative: adj. 1. working or acting *together willingly for a common purpose or benefit* (Random House Dictionary of the English Language).

Contrary to popular belief, the relative size of the Federal government has been steadily declining over the past few decades. In 1952, there were more than 16 Federal employees to serve 1,000 members of the public; today, there are about 12 employees. While this relative decrease in Federal employees has monetary advantages for the taxpayer, it has disadvantages for growing numbers of public land users, who have been steadily increasing their demands for access to and use of public land resources.

One proven method the Bureau of Land Management (BLM) employs to meet demands for public land use—without larger appropriations and staffs—is to involve users in cooperative management efforts. This approach also has the important advantage of increasing public participation by the persons most directly affected by management decisions. For more than two decades, BLM has cooperated with State wildlife agencies in the management of wildlife habitat. Through cooperative agreements, BLM and the States have been able to pool funding and personnel to improve habitats to protect endangered species, increase wildlife numbers, and provide other benefits to wildlife resource users. Volunteer efforts by user groups to help construct and maintain recreation sites, prevent vandalism of historical sites, and assume responsibility for other management activities have netted similar benefits for public land resources and users.

BLM also has been testing other concepts of cooperative resource management for the past several years, through the experimental stewardship program.

In 1978, when Congress passed the Public Rangelands Improvement Act, it directed BLM to try new and innovative approaches to improving the condition of public rangelands for grazing and other uses. Stewardship arrangements emphasizing cooperative management projects between land mangement agencies and livestock operators were specifically mentioned. BLM has since initiated five major experimental stewardship projects in five western States, with three projects jointly organized with the Forest Service. In these project areas, local livestock operators work with other interest groups, involved State and Federal agencies, and BLM managers to explore mutually acceptable alternatives for attaining the multiple-use and sustained-yield objectives established for the public lands through the land-use planning process. These alternatives recognize Federal and State requirements and priorities but reflect local

Imperial Sand Dunes in southern California are intensively used. Members of the Looney Dunes dune-buggy club cooperate with BLM in managing the area and keeping it free of trash.

The Denver Chapter of Women In Mining (WIM) and the Bureau of Land Management have erected seven signs that interpret historic mining sites in Colorado. Here at Leadville, adding finishing touches are Jackie Beasley, corresponding secretary of the Denver Chapter, and Dan Larkin, safety officer for AMAX.

BLM photo Cindy McKee

Ranchers may install cattleguards and other range improvements in accordance with permits or cooperative management agreements. Cattleguards help manage livestock grazing and eliminate gate problems incidental to recreational use of BLM lands.

BLM photo by Cindy McKe

A livestock operator and a BLM range conservationist examine resource conditions in a grazing allotment. Outstanding operators may enter into cooperative management agreements that permit them to install range improvement and adjust grazing use while meeting or exceeding objectives for multiple use resource conditions.

resource conditions and public concerns.

The results of the experimental stewardship program to date have been rewarding. The program has promoted an atmosphere in which land managers, land users, and those that simply appreciate the land and its resources are willing to work together. In many instances, understanding is replacing animosity; acceptance of another's view is producing the compromises and tradeoffs inherent in true multiple-use management. By experiment and practice, allowing greater public particpation in land management decisionmaking has resulted in more equitable resolution of conflicts, more intensive management of resources, and improved condition of the public lands.

With success as the precedent, BLM recently initiated the Cooperative Management Agreement (CMA) program to provide additional cooperative management opportunities to a diverse group of users. A CMA is a formal, written agreement between BLM and a land user or user group for shared management of recreation, wildlife, grazing, or another individual activity authorized on specific areas of BLM land. An off-road vehicle (ORV) group, for example, may enter into a CMA to maintain and monitor vehicle use of a designated ORV area.

BLM will enter into CMA's for various lengths of time, and periodically evaluate the area, depending on resource conditions and the activity being managed. A CMA may be renewed when the periodic evaluations show that the cooperator is managing an activity in compliance with the multiple-use and sustained-yield objectives specified in each agreement. The objectives in the agreements will be those already reached through BLM's resource management planning process, which includes full participation by all interested publics.

BLM exercises its ultimate responsibility for the land through the terms and conditions included in each agreement and periodic monitoring of resource conditions. A CMA does not allow a cooperator to manage, limit, or exclude other uses of an area nor does it exclude the cooperator from existing laws and regulations affecting public land use. BLM can cancel a cooperator's CMA for violation of its terms and conditions.

A major objective of the CMA program is to involve individual livestock operators in cooperative management efforts. BLM recognizes, however, that livestock operators differ from many other users in that they have a direct economic stake in public land use. The profit margin or even the survival of a livestock business may hinge on freedom to adjust grazing use in response to changing market conditions. But economic interest enhances, rather than detracts from, an operator's interest in cooperative efforts to improve public land use. Many operators are dependent upon BLM grazing permits. Thus, as with other users, they are willing to work toward increased resource productivity and use. On the other hand, some ranchers may not be specifically interested in increased use. Their families have used the same grazing allotments for generations and they were brought up with a love of land, or a love of the ranching lifestyle, that transcends profit margins.

BLM designed the CMA program for livestock operators to recognize their special relationship to the land. Certain conditions must be met before an operator is eligible for a CMA. These conditions are:

- The allotment used by the operator must have satisfactory resource conditions, no serious resource use conflicts, and land-use planning objectives are being met.
- Normally, a final livestock grazing environmental impact statement has been completed and the associated land-use plan for the area has been approved.
- The operator has operated on the allotment for sufficient time to demonstrate good

Volunteer sportsmen from Yerington, Nevada and a Nevada Department of Wildlife biologist lower a storage trough into place for a guzzler they are building on BLM lands to supply water needed for wildlife.

Members of the Colorado Federated Women's Clubs tour Lowry Ruins in southwestern Colorado. Club members cooperate with BLM people of the San Juan Resource Area, Montrose District, in interpreting cultural resources.

rangeland management practices and to be recognized by others as a responsible land steward.

- The District Grazing Advisory Board and District Advisory Council recommend approval of the CMA with the selected operator.
- The operator agrees to contribute toward the construction of rangeland improvements.

Operators must first be nominated as outstanding grazing managers and then approved by a screening committee before they are eligible for a CMA. They can be nominated by Soil Conservation Districts, State and Federal wildlife agencies, advisory committees, or other local groups. District advisory committees or a specifically designated group screens nominees before BLM begins to negotiate CMA's with any operators.

Cooperative management agreements with livestock operators are issued for ten years, with a resource evaluation at the end of the first five years. The agreement term corresponds with the ten-year tenure of an operator's grazing permit or lease. If the five-year evaluation shows the operator's grazing management practices are helping to achieve the multiple-use and sustained-yield objectives in the CMA, BLM may renew both the CMA and operator's permit or lease for another ten years from the time of the evaluation. In other words, every five years, an operator who continued to meet the ojectives of a CMA would be assured of another ten years of grazing use. This assurance of tenure is an incentive for the operator to invest in rangeland improvements on the public lands.

Under a CMA, an operator may adjust the season of use and numbers and kinds of livestock grazing on the allotment. Fees for the grazing use may be paid at the end of, rather than prior to, the grazing year to account for fluctuations in use. This flexibility, however, will be within parameters set by BLM, as required by the Taylor Grazing Act. If an allotment is under an allotment management plan (AMP), the CMA may incorporate the terms and objectives of the AMP.

Another benefit of the CMA program to livestock operators is the basic fact it provides a reward for past and continuing good stewardship.

Any resource user group may enter into a cooperative management agreement. BLM in California, for example, has signed a CMA with San Bernadino County to help finance on-site interpretation and protection of resources in the Calico Early Man Site. BLM's California State Director plans to implement several CMAs in 1984. One is with a local dune buggy group to monitor, maintain, and control ORV use of an area in the Samoa Peninsula. Another calls for the National Outdoor Coalition to provide a total management package for the Dumont Dunes, including dune stabilization, plant and wildlife protection, necessary maintenance, monitoring of closed areas, and help in implementing a management plan. Under another agreement, the Sierra Club will construct and maintain certain parts of the Pacific Crest National Scenic Trail. These CMA's will supplement cooperative management and volunteer opportunities already available.

Cooperative management agreements will enable BLM to concentrate appropriated funds on areas where intensive Federal management is most needed. In addition, cooperative management efforts, such as those just described, should provide the public with facilities or user opportunities that would not be possible under BLM capabilities alone. The common goal of BLM and the public is to improve resource conditions for all users. Working together toward this goal will help make it possible for BLM to meet the user demands of the future. ▽

Charlotte Yarrington-Ball is in the Division of Rangeland Resources, Bureau of Land Management, Washington, D.C.

Cooperative Habitat Management for California Wildlife

By Jerry Boggs and Louisa Beld

Californians take the lead on many aspects of American life, from health foods to hot tubs. Currently, Californians are leading the West in forming a State and private partnership with the Bureau of Land Management (BLM) to benefit wildlife on the lands BLM manages. State and private contributions of funds, materials, and labor have grown from $147,000 in 1982, to $308,000 in 1983, and are projected to be approximately $444,000 for 1984. Together, these groups are helping BLM successfully accomplish jobs ranging from prescribed burnings to airlifting bighorn sheep into their historic habitat. The beneficiaries of these efforts include peregrine falcon, desert bighorn sheep, desert tortoise, and salmon, among many other species.

To help understand how important the lands managed by BLM are to wildlife in California, we need to consider the numbers involved. Approximately 46 percent of the 101 million acres that make up California is Federal land, with BLM managing about 18 million acres. These millions of acres supply diverse habitats to an incredible range of wildlife species, from the commonplace mule deer to the endangered California condor. Millions of the 25 million people that reside in California use the public lands for hunting, fishing, nature photography, and other forms of wildlife-related recreation. In fact, some areas of BLM public lands in California are enjoyed by thousands of visitors each day.

Californians are proud of their wildlife, and feel strongly about working to protect and improve this valuable resource. In some cases, they are cooperating in habitat protection measures designed to mitigate the effects of other multiple-use activities authorized on the public lands, such as timber harvesting, livestock grazing, and energy development. In other cases, they are participating in projects to improve wildlife habitat. Several of these ongoing efforts are described, as follows:

California Conservation Corps crews fence a small valley in the King Range where relocated Roosevelt elk were held temporarily to help them form an attachment to the area.

BLM photo by James Decker

Relocating Bighorn Sheep to Whipple Mountain

The Whipple Mountains are an isolated desert range in the southeast part of California. Although these mountains were once the home of bighorn sheep, inadequate water and forage due to competition from wild burros probably drove the sheep to find more hospitable range. The California Department of Fish and Game, together with private citizen's groups such as Desert Wildlife Unlimited and the Society for the Preservation of Bighorn Sheep, are now working with BLM to make the Whipple Mountains the home of bighorn sheep once again.

BLM photo by James Decker

The radio collar on the neck of this Roosevelt elk cow enables biologists of the California Department of Fish and Game and BLM to monitor her travels and judge the success of the project to relocate animals in the King Range.

BLM photo by Stephen Waste

Crews of inmates from a minimum security prison help BLM clear firehazardous brush from around the base of bald eagle roosting and nesting trees.

BLM photo by Gary Ferrier

A radio-collared desert bighorn sheep disappears into the brush at the Whipple Mountains relocation site.

The first step toward relocating bighorn sheep to the Whipple Mountains was to improve the existing habitat. After excess burros were removed from the area in BLM's Adopt-A-Horse or Burro program, a 320-acre site surrounding a reservoir managed by the Metropolitan Water District of Southern California was enclosed. Next, a 1,600-gallon guzzler was constructed in a strategic location. Their home prepared, 21 sheep were captured and airlifted by helicopter to the Whipple Mountain site.

The temporary enclosure will keep the sheep in the relocation area for several months until the lambing season has passed. It is hoped that by keeping the ewes in the area through lambing, the sheep will form an attachment to the site as a lambing ground. Once released from the enclosure, the sheep probably will remain near the water sources provided by the reservoir and the newly installed guzzler as their necessary water sources.

BLM will move the enclosure fencing to another part of the Whipple Mountains next year, to be used in a similar relocation effort. If this gradual reintroduction is successful, the Whipple Mountains will be supporting a large and healthy population of desert bighorn sheep within the next decade.

Returning Roosevelt Elk to the King Range

Across the State from the Whipple Mountains, along the northern coast of California, lies the King Range. This range supported large herds of Roosevelt elk, until the herds were essentially wiped out by hunters supplying meat to gold-rush hopefuls and commercial markets. A cooperative effort is now underway to return the Roosevelt elk to its historic habitat in the King Range. This relocation will be accomplished by transferring elk from overpopulated sites.

California Conservation Crews, under the supervision of the California Department of Forestry, prepared the relocation site by constructing an eight-foot fence around a small valley in the southern portion of the King Range. This valley became the temporary home of sixteen relocated elk. By placing radio collars on the elk, the California Department of Fish and Game and BLM were able to monitor the activities of the elk for several months before and after releasing them into the wilds of the mountain. Half of the animals migrated from the area, but half found the King Range to their liking and may remain. These elk will be supplemented by others to help reestablish a successful herd.

Inmates and Eagles

The State of California and BLM

have introduced an innovative approach to labor-intensive habitat improvement in the Susanville District of northeastern California. BLM is arranging, through the California Department of Corrections, to use inmates from a nearby minimum security prison to clear the brush around trees used for nesting by the endangered bald eagle. The dense brush that accumulates beneath such trees creates a real fire hazard to the nesting sites.

Inmates also are involved in fencing important riparian areas to exclude livestock grazing. These penal crews will be supplying over 800 workdays of labor for rangeland improvement during FY 1984.

Protecting the Desert Tortoise

The Desert Tortoise Natural Area is 38 square miles of prime desert tortoise habitat, located between the town of Mohave and Ridgecrest in northeastern Kern Country. The natural area concept for tortoises originated with a group of concerned citizens who formed the Desert Tortoise Preserve Committee and worked for the site designation. Since the establishment of the natural area, the Committee has continued to aid BLM in the tortoise's protection. The Committee contributed to studies on the desert tortoise and on other desert wildlife and habitat within the area. The Desert Tortoise Preserve Committee also has helped arrange educational tours of the natural area.

Merced River Prescribed Burn

The Merced River Canyon stretches west from Yosemite National Park toward the San Joaquin valley. The area is covered primarily by dense stands of chamise and manzanita chaparral. Normally, lightning-caused wildfires every 15 to 20 years would have limited the growth of brush. However, intensive wildfire prevention and suppression during the past 40 years allowed the chaparral to become dense and decadent. These old, dense stands of chaparral reduce rainfall runoff and infiltration as well as food and cover for the normally diverse and numerous wildlife species that use the area.

BLM photo by Marta Witt

A helitorch, suspended from a low-flying helicopter, is used to ignite the brush on areas targeted for prescribed burning. Revegetated with forbs and grass, burned spots provide a mosaic with unburned cover to benefit numerous wildlife species.

BLM, in cooperation with the California Department of Forestry, has proposed prescribed burning to intersperse small islands of forbs and grasses within the surrounding area of chaparral. The small openings will provide browse food for various wildlife species, while the remaining stands of chaparral will offer the cover needed for wildlife survival. Under the proposed plan, approximately 5,500 acres would be burned the first year of a five-year program. Approximately 3,000 acres would be burned during each of the last four years. The program should be well underway during 1984, so long as burn attempts are not thwarted by the unusually wet weather that plagued burn efforts in California last year.

These five examples illustrate the diversity of ongoing cooperative efforts between BLM and State and private groups to benefit wildlife on the public lands BLM manages. Youth groups, resource management interest organizations, off-road vehicle associations, and many other groups and individuals are also helping to protect fragile riparian habitat, install watering sources in desert areas, and accomplish other worthwhile habitat management objectives. BLM extends its sincerest thanks to the people involved, without whose help many of these projects would not have been possible or as extensive. ▽

Jerry Boggs is a wildlife management biologist and Louisa Beld is a public affairs specialist in BLM's California State Office, Sacramento.

Cooperation Balances Mining and Environmental Concerns

By Robert Hium

How molybdenum is produced in an environmentally sound manner in central Idaho is a story of cooperation.

It started in 1979, when the Cyprus Thompson Creek Mining Company, Inc., began developing plans to mine molybdenum in a 25-square-mile area 35 miles southwest of Challis, in Custer County, Idaho. In that area, 93 percent of the land is managed by the Bureau of Land Management and the Forest Service. The company is a subsidiary of Standard Oil Company of Indiana and a descendant of Cyprus Mines, a company operating since 1917 in developing copper mines on the Mediterranean island of Cyprus and in Arizona, as well as iron mines in Peru and Australia.

At the same time that proposed operating plans were filed with BLM and the Forest Service, the Cyprus Thompson Creek Mining Company engaged a consulting firm, Denver Research Group, Inc., to assess the project's impacts on Challis and Custer County. Representatives of the company, the consulting firm, and federal and state officials met with local officials, environmental groups, and interested residents of the area. They discussed housing, taxation, schools, sewage, water supply, transportation, social services, environmental and resource impacts, protection of the Salmon River (five miles below the mine) and monitoring of construction practices. Legislation providing for pre-payment of taxes to expand and develop community services was of great interest during the discussions.

In December of 1980, the environmental impact statement was filed, with the concurrence of BLM and the Forest Service. Construction began in February of 1981. Following approval of Cyprus' operating plan, several state and federal agencies became involved in license and compliance monitoring.

Barry Davis, Yankee Fork District Ranger for the Challis National Forest, suggested forming an interagency task force. The committee was unique, the first of its kind in Idaho. Representatives from the Bureau of Land Management, Forest Service, and the Idaho Departments of Lands, Health and Welfare, Fish and Game, and Water Resources were appointed to inspect the project regularly with Cyprus representatives.

Through this task force, state and federal agencies were kept informed of the progress and problems of development of one of the world's largest producing molybdenum mines in the State's most environmentally sensitive area.

The interagency team acted as a clearing house for all necessary license applications and monitored the operating plan and construction practices of the project. The committee eliminates duplicate work when possible and members aid each other in administering the project.

Dr. John Moeller, State Department of Health & Welfare, has the primary responsibility for water quality.

Robert Hium, Bureau of Land Management, has the primary construction monitoring responsibility for roads, powerlines, and pipelines.

Larry Jones, State Department of Lands, has the lead to review the design and construction of reclamation work.

Glen Saxton, State Department of Water Resources, has the primary responsibility regarding the appropriation and use of surface and ground waters and stream channel alterations, and for the review of design and construction of the tailings embankment

A federal-state-private task force coordinates molybdenum mining operations in central Idaho to safeguard environmental quality.

A 1 1/4 mile-long, covered conveyor brings 9-inch-minus concentrate to the crusher. The concentrator has a capacity of 25,000 tons of ore per day.

and related facilities.

Pat Green, task force chairperson, Forest Service, has the primary monitoring responsibility for design and construction of waste dumps in coordination with the State Department of Lands.

Mark Armbruster, State Department of Fish & Game, has the primary responsibility for coordinating wildlife habitat mitigation measures.

All members coordinate the administration of their respective regulations with each other, and each member keeps the other members informed of activities that affect their respective areas of administration.

Historically, mining has played an important part in Idaho and in Custer County. Several old mines are located in the area. Clayton Silver, Bayhorse, Yankee Fork, Redbird, Twin Apex Mines are just a few of the historic operations in the area. Cyprus staked it's first mineral claims at Thompson Creek in 1967 and through intensive exploration a significant ore body of molybdenum was discovered.

The mineral molybdenite is commonly referred to as "moly." Molybdenum is both strong and heat resistant, with a melting point of 4,740 degrees Fahrenheit. It can endure almost twice as much heat as iron. This property makes it a vital component of products encountering extreme temperatures, like missile nozzles and jet engines.

More commonly used as an alloy, moly greatly enhances steel's strength and durability. In this capacity, it is used in the production of diverse consumer goods, industrial equipment, and energy.

Most people encounter moly daily. Most incandescent light bulbs have a molybdenum filament. It also adds strength to light-weight metals used in backpacks and bicycles; makes stainless steel tougher and enables auto parts, as well as airplane and railroad equipment, to wear longer. As a lubricant, moly makes oil more slippery.

Moly also contributes to improving environmental conditions. As an ingredient in the special stainless steel used in pollution control equipment, moly helps clean plant emissions. As a catalyst in refining processes, it makes fuel burn more efficiently and cleaner. In many instances, non-toxic moly derivaties have replaced posionous anticorrosion agents and pigments in paints.

Moly is used extensively in industry. Steels and other alloys containing moly are used in the development, transportation, and refining of oil and gas, coal gasification and liquification processes, generation of hydroelectric power, fabrication of solar collectors, and for many other purposes.

Unfortunately, moly is not found in high grade ore bodies. It is widely disseminated. Identifying the moly and separating it from its host rock is a sophisticated, technical, and costly process. Cyprus did 57,000 feet of surface core drilling, dug a tunnel more than 8,000 feet into the heart of the ore body, and completed 41,000 feet of underground drilling to determine the extent of the moly deposit. This helped develop a reliable cross-section of the Thompson Creek moly deposit indicating at least 200 million tons of ore, averaging a molybdenum content of 0.18 percent. This information also indicated that the ore body, which is situated in rugged terrain, lies under 100 to 500 feet of barren waste rock called overburden and at its deepest point is 1,500 feet below the surface.

Cyprus, aside from the required environmental monitoring, has on its own initiative required all Cyprus personnel to be aware of the company's concern for the environment. It is the employees' responsibility to carry out corporate philosophy. With the help of Boise State University, Cyprus developed an innovative environmental training program for employees. The mandatory three-hour course emphasizes such things as recreational ethics, wildlife management, and fish and game laws.

Cyprus has been very cooperative in providing construction plans for review by the task force and in reporting progress, sometimes on a daily basis. This helped smooth out many construction problems. The task force has an excellent working relationship with Cyprus and its construction contractors.

Robert Hium is a realty specialist in the Bureau of Land Management's Salmon District in Idaho.

Water Resources Management

By Bruce Van Havern and Collis Lovely

Water is one of the renewable natural resources for which the Bureau of Land Management (BLM) is responsible. A transient and sometimes limited resource, its importance is especially realized during the cyclic droughts and periodic floods which occur every few years in the natural environment. Water occurs in rivers, lakes, ponds, reservoirs and wetlands of all sizes and characteristics. In addition, much valuable water is contained in aquifers beneath the surface of the lands.

As a land and resource management agency, what are BLM's responsibilities for water resources? Water is certainly essential for range livestock, wildlife habitat, and recreation. But beyond those direct uses, water from BLM lands frequently is used downstream for irrigation, power generation, water-based recreation, and for domestic and industrial purposes. Management of water resources is thus an important function of BLM.

BLM's primary objective for water resources management is to protect, maintain, and improve the quality of water resource and watershed values, including surface and ground water quality, quantity, and timing. BLM has the following water-related responsibilities:

- policy and guidance for surface and ground water resource management;
- watershed protection and rehabilitation;
- administering BLM's water rights, uses, and needs;
- controlling nonpoint source pollution under the Clean Water Act;
- coordinating the Colorado River Basin salinity control program;
- ensuring that activities on BLM lands comply with applicable water pollution control laws;
- inventory and monitoring of water resources and watershed conditions and trends;
- floodplain management; and
- coordination with other state, local and federal water resource management agencies.

Resource management plans incorporate BLM's responsibility in these areas and identify opportunities to better manage watersheds. Hydrologic support to Bureau programs is provided through the collection and analysis of basic water resource and hydrologic data. This information is used in various BLM planning, project design, and implementation activities.

Water Rights Policy

Water rights issues are just as controversial today as they were in the old West. Two recent opinions issued by the Department of the Interior Solicitor significantly affected BLM's water rights policies. In one opinion, the Solicitor ruled that BLM must file with State water rights administrators to acquire the right to use waters on public lands, the same as any other group or individual, except in the case of federally-reserved water rights.

The second opinion was that uses of waters withdrawn under an Executive Order of 1926 are limited to human and animal consumption. A previous opinion concluded that the purposes included agriculture, flood, fire, and erosion control.

The most important aspect of current policy is that it emphasizes the states' primary authority and responsibility for allocating and managing water resources within their boundaries, except as specified by the Congress as in the case of reserved water rights. BLM complies with State filing requirements for the use of non-

In Wyoming, snow fences—like this one at Saratoga in the Stratton study area—trap snow to increase stream flow. Gauges measure results.

Livestock operators may hold rights to water developments, such as this reservoir, that they finance. Wildlife, as well as livestock, benefit from strategically located water developments.

Opportunities for canoeing, rafting, swimming, and fishing—as well as drinking water for livestock and wildlife—are resources of the lands BLM manages. Downstream, water is used for irrigation, power generation, and other industrial and domestic purposes.

This stream gauge helps monitor the effects of a livestock grazing system in the Rio Puerco area of New Mexico by measuring hydrologic response. Relationships between surface and ground water behavior and various land-use activities are being studied by BLM hydrologists.

reserved waters on lands BLM manages.

To encourage private investment in range improvements on BLM's public lands, grazing permittees may obtain and hold solely in their names the rights for water sources which are developed entirely with private funds on BLM lands and also for certain water sources developed cooperatively with BLM. The permittee may also be a coholder of a water right with BLM on certain types of water sources developed jointly with BLM.

Water Resource Management Issues

The Federal Land Policy and Management Act of 1976 called for an inventory of all natural resources on the public lands. The inventory initiated by BLM includes both surface and ground water supplies and uses. In addition to quantifying how much water is present, hydrologists are attempting to better understand the relationships between surface and ground water behavior and various land-use activities. What is the intensity of grazing that a given area can support without accelerated soil erosion taking place? Can we lease minerals and permit mineral extraction in areas of important ground water aquifers? How can we best design roads and timber harvest systems to minimize the potential for downstream flooding and sediment production? In all its activities, BLM must be cognizant of, and responsive to, mandates of the Clean Water Act and associated legislation. For example, BLM hydrologists and soil scientists have been working with other Federal and State groups to identify sources and methods of controlling salt contributions to the Colorado River Basin. High salinity levels in the Colorado River are of international concern. Projects are underway in Colorado and Utah to trap and dispose of salt-laden water before it reaches Colorado River tributaries.

Watershed Management Activities

Watershed management refers to the use, regulation, and treatment of water and soil resources of a watershed to accomplish stated objectives, primarily the production and protection of water supplies and water-based resources, including control of erosion and floods, and protection of esthetic values associated with water. Activity plans are prepared which address the special management of municipal watersheds, floodplains, and sensitive headwater areas. Efforts are underway in many BLM districts to stabilize and rehabilitate watersheds disturbed by fire and floods and by the excessive overgrazing which occurred earlier in the century.

In the 1950's and 1960's, BLM carried out an extensive construction program of structural watershed treatment measures. Many of these structures are approaching or have exceeded their design life. Bureau hydrologists and soil scientists are now investigating these previous projects, determining current watershed conditions and project maintenance needs, preparing watershed activity plans, and recommending improvement projects on areas with the most critical soil and water problems.

Through research and development efforts, BLM scientists have learned much about the hydrology of wildlands. For example, mechanically or chemically controlling sagebrush and other deeply rooted vegetation, can make more water available in the soil for desirable plant species. Research on high elevation sagebrush lands in Wyoming recently demonstrated a 20 percent increase in streamflow as a result of selective sagebrush removal. Other experiments have tested the use of snowfences to increase water supplies for livestock and wildlife.

Demand for Federal coal increased dramatically in the early 1970's following the international oil embargo. Concern over the potential impacts of surface coal mining on water supplies prompted BLM to initiate hydrologic investigations on Federal coal lands. These investigations have helped hydrologists to better understand the relationships between water resources and coal extraction. With this knowledge, managers can make more intelligent decisions on coal leasing, mining impact mitigation, and rehabilitation procedures. ▽

Bruce Van Havern is a hydrologist in BLM's Branch of Physical Resources, Denver Service Center, Colorado.

Collis Lovely is a hydrologist in BLM's Headquarters Division of Rangeland Resources, Washington, D.C.

HIDDEN CAVE

The Public Meets The Past

By Steve Weiss

Cultural resource management objectives have been creatively achieved at what is today the premier archaeological cave site on public lands administered by the Bureau of Land Management (BLM). The prehistoric record, revealed by scientific investigation and presented in a public interpretive program, makes Hidden Cave valuable to archaeologists and fascinating to visitors.

On a hillside that was once a shore of Ice Age (Pleistocene) Lake Lahontan, Hidden Cave overlooks the broad Lahontan Valley, in western Nevada near Fallon, within BLM's Carson City District. Visitors hike a half-mile trail and duck through a three-foot-high entrance to find a single room 100 feet across and 15 feet high.

Discovery

In the mid-1920s, four Lahontan Valley school boys were the first twentieth century humans to find Hidden Cave. Among the dozens of other caves and overhangs in the Grimes Point area, this one had escaped notice for so long because its small entrance was inconspicuous. For several years the boys occasionally returned but kept the cave a secret.

Fallon anthropologist Margaret Wheat first learned of Hidden Cave in the mid-1930s from a bat guano miner named McRiley, who guided her there. Guano removal virtually destroyed cultural resources in other Grimes Point Caves, so it is well that McRiley found extraction from Hidden Cave unprofitable. Mrs. Wheat encouraged archaeological institutions to investigate, and in 1940 the first professional excavation took place there.

Early Excavations

S.M. Wheeler, archaeologist for the Nevada State Park Commission and assistant to the superintendent of Nevada State Parks, secured limited funding to study the "Bat Caves" near Grimes Point. Mrs. Wheeler actually did most of the excavation in Hidden Cave, while Mr. Wheeler guided tours of the project for a highly interested public. The local press covered the story, and 753 visitors registered for tours that summer. Unauthorized artifact collecting and other vandalism was a major problem for Wheeler, so he placed an iron gate at the enlarged cave entrance. The Wheelers' findings are curated at the Nevada State Museum in Carson City, but their work was never published.

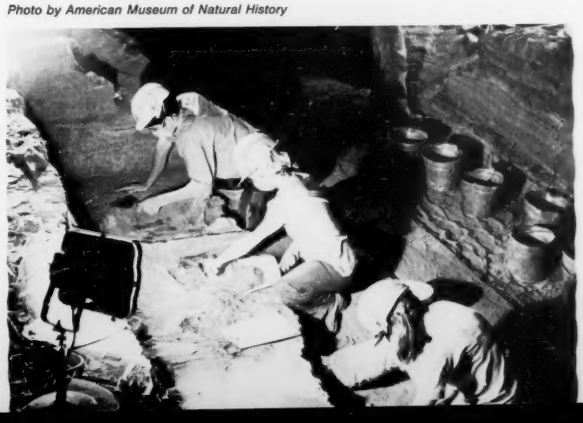
In 1951, University of California (UC) archaeologists Norman Roust and Gordon Grosscup teamed with U.S. Geological Survey geologist Roger Morrison to further excavate and study deposits in Hidden Cave. Their main goals were to learn more about the prehistoric inhabitants of the area and to establish a chronology of the ancient lake. The Lowie Museum at UC Berkeley curates their unpublished records and artifacts.

The Nevada Division of State Parks nominated the Grimes Point Archaeological Area, including Hidden Cave, to the National Register of Historic Places in 1971. The following year, the National Park Service placed the property on the Register. By 1976, BLM's Carson City District had established an aggressive program of cultural resource management at Grimes Point. Its archaeologist and outdoor recreation planners developed patrols, an interpretive trail for visitors through a major petroglyph site (see OUR PUBLIC LANDS, Winter 1978), and a teachers' study guide.

The Latest Archaeological Project

Carson City District archaeologist Brian Hatoff had worked previously on Great Basin projects with Dr. David Hurst Thomas, chairman of the American Museum of Natural History's Department of Anthropology and Curator of North American Archaeology. Both recognized the potential significance of Hidden Cave for futher research and as a public attraction. In 1978, they outlined

Photo by American Museum of Natural History



Archaeological students from the University of Nevada, Reno, get first hand experience in careful excavation techniques.

Chronology of Hidden Cave

Approximate Years Before Present	Event of Period
Present to 3,500	Dramatic reduction in sedimentation and human usage. Entrance to cave nearly closed.
1,100	Volcanic ash layer from Mono Craters eruption.
3,500 to 3,600	Midden indicates second episode of intensive human usage.
3,600 to 3,700	Accelerated siltation indicates period of greatly increased precipitation.
3,700 to 3,800	Midden layer caused by intensive human use of cave.
4,000 to 10,000	Dramatic change in deposits — windblown silts from dry lake beds washed in from hillside.
6,900	Mount Mazama erupts, leaving distinct layer of volcanic ash in cave.
6,500 to 7,500	Transition from mesic flora and fauna to present composition of desert species. This indicates change from a moderately moist to a much drier climate.
7,500 to 10,000	Cave still moist inside from marsh environment and receding lake.
10,000 to 21,000	Cave alternately submerged beneath and exposed above fluctuating Lake Lahontan.
21,000	Completion of cave formation by wave action from Ice Age (Pleistocene) Lake Lahontan.

a cultural resource management project that would provide for research needs, public use, and resource protection. Hatoff and Thomas conceived a third major excavation of the cave to answer current scientific questions, using newly developed techniques. The project was also to accomplish reanalysis of the 1940 and 1951 collections, publish a scientific monograph, and recommend ongoing management of the site.

Dr. Thomas answered the question "Why bother digging Hidden Cave again?" by posing unanswered questions in anthropology which might be solved, at least in part, by examining the cave's deposits. A large scale problem was to link theories about hunter-gatherer environmental adaptations with actual cultural evidence. Specifically, were the Toedokado Northern Paiutes required to move constantly throughout their territory to forage for the necessities of life? Or was food production in the desert lake and marsh environment reliable and abundant enough to allow them to establish a major residential base? Or was their adaptive strategy somewhere between the extremes of constant mobility and sedentary existence? Reconstruction of the prehistoric lifeways and refinement of the chronological record were other research aims.

Advanced methods available to archaeologists since the 1940 and 1951 excavations include analysis of pollen, coprolites (excrement), other plant materials, and faunal remains. Radio-carbon dating had become a more precise tool. Standard excavation techniques in general had become more refined. Some of these new methods of investigation were applied to the earlier collections as well as to new findings.

The American Museum and the Bureau devised a scheme for

BLM photo by Steve Weiss

Archaeologist Brian Hatoff uses graphics to illustrate the story of Hidden Cave to a visiting school class.

financing and otherwise supporting the project, involving a blend of contributors and interested parties to pursue a diversity of complementary goals. The Bureau issued a contract to the Museum for the project, and the American Museum contributed funds, salaries, and volunteer services. The Nevada Division of Historic Preservation and Archaeology added major funding through matching grants. A University of Nevada, Reno, archaeological field class participated in the work, providing additional labor and indirect funding. The Speidel Foundation and Sun Energy Development Corporation donated private monies. A variety of additional support was given by the Churchill County Museum, the Churchill County School District, the Fallon Naval Air Station, the Nevada National Guard, and many individuals. Thus Hatoff and Thomas arranged a support system that maximized involvement in and the spread of benefits from the project, marshalling altogether more than $100,000—far more than a single source could have afforded.

An interdisciplinary research team under Dr. Thomas' direction included specialists in geology, paleobotany, paleozoology, and several branches of anthropology

Two paleobotanists analyzed the seeds, pollen, and other plant materials present in coprolites and various cave strata. Three zoologists studied the remains of fish, birds, mammals, reptiles, and amphibians. All of these floral and faunal studies indicated major changes in plant communities and animal populations as the climate became more arid. Plant and animal materials used for food and other purposes were also identified.

Several archaeologists studied a broad assemblage of artifacts well preserved by conditions inside the cave. Thomas called the cave an "artifact trap," because the earlier people had stored an abundance of intact specimens of articles there. They included bone pendants, beads, cordage and netting, clothing, basketry, matting, projectile points, and even an atlatl (spear thrower).

A University of Nevada Desert Research Institute geologist studied the statified sedimentary deposits, the ages and origins of strata, and the geological processes of deposition. Hidden Cave and other caves in the area were created in the bedrock of tufa-cemented gravels by wave action on the shores of Lake Lahontan. Three primary means of sediment deposition inside the cave were the settling of lake silts, the washing in of sediments with storm runoff from the hillside through the entrance, and the downward movement of material from the back of the cave. The most dramatic layer is a half-inch-thick white band of volcanic ash which washed in from the hillside soon after the eruption of Mount Mazama 6,900 years ago—the same eruption which formed Crater Lake in southern Oregon. Two midden layers, darkened by organic matter content, represent periods during which humans brought in large quantities of plant materials. The nearly undisturbed layered deposits provided a timeline or chronology, based on the principle that older strata underlie more recent ones. The sequence of events and periods are highlighted in the accompanying table.

Hatoff and Thomas thought there might be enough work in Hidden Cave to occupy one field season, but during the 1979 season they encountered so much more that a second full eight-week field season was needed to complete the work. It was an archaeologist's dream come true, for most other caves which could have yielded similiar findings had been either disturbed by vandals beyond recovery or excavated professionally before archaeological excavation had advanced to the present degree.

A high proportion of artifacts found were unbroken and arranged in concentrations. That led to the conclusion that people 3,500 to 3,800 years ago used Hidden Cave more for a cache site than for their own shelter. They stored projectile points, other weapons, fish nets, tools, food, and many other articles which they could not carry when they left the area but would use when they returned.

The American Museum of Natural History, based in New York City, has published "THE ARCHAEOLOGY OF HIDDEN CAVE," a comprehensive scientific monograph, written by scientists

BLM photo by Steve Weiss

Marked layers of sediment in Hidden Cave are described by Brian Hatoff to a group of visitors.

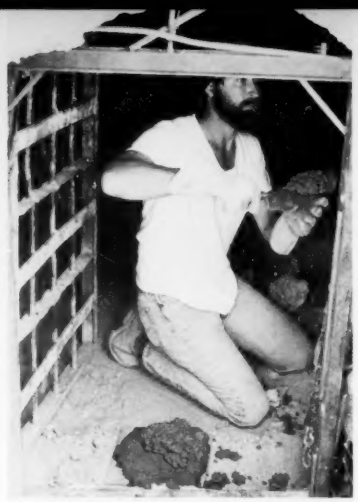
on the team and edited by David Hurst Thomas. The monograph documents the entire project and addresses the questions raised earlier. The Toedokado Northern Paiutes and their predecessors did not occupy the Grimes Point area all year but used Hidden Cave for storage when they were there, particularly during the summer, early fall, and some years in early spring.

Still other questions were raised and remain unanswered. Where did the population spend other parts of the year, and for how long? Thomas knew from the start that not all information could be ascertained through examination of a single site. Different sites in the territory provide different kinds of information. More answers may soon be forthcoming when the results of a regional archaeological survey of nearby mountains and valley by Robert Kelly of the University of Michigan are published.

A concern of modern archaeology and cultural resource management heeded in the most recent Hidden Cave project is to leave a significant portion of the site undisturbed to allow for future examination. Cultural resources are non-renewable and can only be collected once. Anthropologists in the future may again want to research questions using new methods of their day.

Management for the Public

Maintaining secrecy of archaeological sites may be a valid protective strategy in some cases, but not in all. Wheeler's public tours of the 1940 excavation had proved very popular, and the location had become well known. Why shouldn't the interested public benefit from the resource again? By knowing about Hidden Cave, the public could gain a better appreciation of cultural resources and a greater understanding of the field of archaeology. An informed citizenry could help protect the site through a self-policing ethic.



BLM photo by Steve Weiss

A new 400-pound door is installed by Mike Grannis, BLM technician, to prevent vandalism when Hidden Cave is closed to visitors. S.M. Wheeler's earlier iron gate is still in place at the left of the picture.

Hatoff, Thomas, and Bureau managers agreed to publicize the project aggressively. Just before the 1980 field season "Nevada Magazine" published a popular article by Thomas, which promoted weekend tours of the site and the laboratory set up at the Churchill County High School. News coverage was extensive in Nevada and national media. About 1,200 persons visited Hidden Cave during the 1979-80 excavations.

The tours were again so popular that allowing continued public visitation became a management objective. The Bureau contracted with the American Museum to study the feasibility of opening the site for public tours while still providing adequate resource protection. A program of public tours and a substantial locked door would let visitors see the cave yet maintain security of the site. Churchill County Museum director and curator Sharon Taylor offered to recruit volunteer guides for Hidden Cave tours.

To prepare the cave for tours and prevent vandalism, Hatoff and other Bureau employees designed and installed a double-locking door specially manufactured of heavy steel. They devised and improved an interior lighting system powered by a gasoline generator and built an attractive wooden walkway. Dennis O'Brien of the American Museum of Natural History was commissioned to create interpretive graphics to be mounted inside the cave, and with Bureau of Reclamation funding he later produced interpretive signs along the trail leading to the cave. BLM also contributed toward the production of a permanent exhibit on Hidden Cave by Dennis O'Brien for the Churchill County Museum. A Nevada State Museum archaeologist replicated an atlatl and a small game club for demonstration on tours. Brian Hatoff trained several volunteers and BLM employees to be tour guides.

On September 29, 1982, opening day dedication ceremonies were held at both Hidden Cave and the Churchill Museum. Speakers at the cave ceremony included Dr. David Hurst Thomas, Nevada State Historic Preservation officer Mimi Rodden, Sharon Taylor, Nevada BLM State Director Ed Spang, and BLM Carson City District Manager Tom Owen.

Bureau volunteers and employees now guide two scheduled tours monthy and usually several special tours for school classes and many other groups. About 4,500 visitors toured the cave in the first year.

Hidden Cave is a classic example of success resulting from cooperation by public agencies, private organizations, and individuals in spite of financial, logistical, and other constraints. Flexibility and innovation have made possible the achievement of "diverse yet complementary goals," as Hatoff and Thomas state in "THE ARCHAEOLOGY OF HIDDEN CAVE." ▽

Steve Weiss is the environmental protection specialist and public affairs specialist in the Bureau of Land Management's Carson City District in Nevada.

Idaho Earthquake

By Steve Moore and Dave Hovland

The townspeople of Salmon, Idaho were awakening to a beautiful autumn morning as we were driving through the downtown area a few minutes after 8:00 a.m. on Friday, October 28, 1983. We were returning to Boise after completing a week of geologic mapping of phosphate resources in the Salmon District. Suddenly, the peaceful mountain morning was shattered as powerful forces within the earth's crust were unleashed. Normal morning activities of the town were interrupted as window panes vibrated and alarmed people ran into the streets. We were witnessing first hand the effects of a major earthquake.

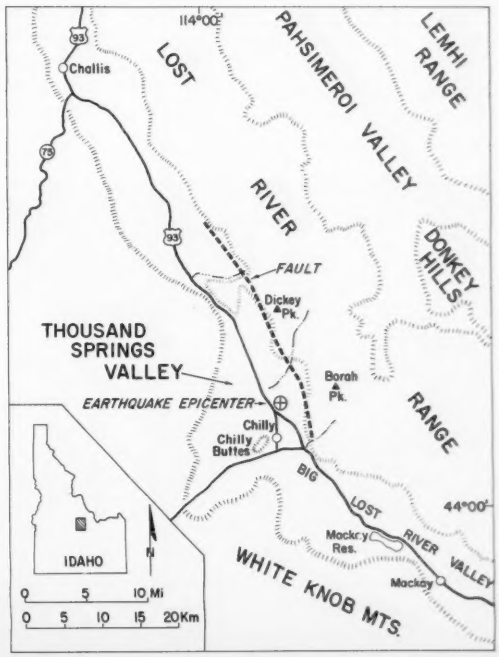
The earthquake occurred at 8:06 a.m. with the epicenter located 75 miles south of Salmon in a sparsely populated area 19 miles northwest of Mackay, Idaho, near 12,662-foot Borah Peak. According to the National Earthquake Information Center in Golden, Colorado, the earthquake had a magnitude of 6.9 and was located near Latitude 44.12°N, Longitude 113.87°W at a depth of about five kilometers. This was the strongest earthquake to hit the western United States in 24 years.

After observing the effects of the earthquake in Salmon, we decided to follow a roundabout route, avoiding reported rock slides, to reach the major earthquake zone paralleling U.S. Highway 93 between Mackay and Challis. Much of the land in the Challis-Mackay region is managed by the Bureau of Land Management and the Forest Service.

Geologic Setting

The earthquake occurred along a north-to-northwest-trending fault on the southwest flank of the Lost River Range. The Lost River Range is one of several northwest-trending mountain ranges in east-central Idaho. The ranges are separated by broad sediment-filled valleys, and have range-front faults on their southwest flanks. This region has been described as having potential for earthquake activity. This earthquake was the largest in the western United States since the 7.1-magnitude Hebgen Lake, Montana earthquake of 1959, and the largest in Idaho since the 6.1-magnitude Pocatello Valley earthquake on March 27, 1975.

Eastern Idaho is within the Intermountain seismic belt, a zone of concentrated seismic activity extending northward from Arizona through northwestern Montana. The October 28, 1983, earthquake is associated with a seismic zone



The dashed line shows the location of the surface fault rupture associated with the Idaho earthquake of October 28, 1983.

that extends westward from the Yellowstone-Hebgen Lake area into central Idaho north of the Snake River Plain. Ten previous earthquakes have been reported in central Idaho during this century, with some as recent as April 1983.

Primary effects of the October 1983 earthquake included ground shaking and surface rupture directly related to movement along the fault bounding the western flank of the Lost River Range. Ground shaking was most intense near the epicenter between Challis and Mackay, Idaho, but the earthquake was also felt over most of the northwestern United States and in parts of southwestern Canada. The initial shock was followed by numerous aftershocks.

Secondary effects included seismically induced landslides, ground cracking, and modification of the hydrologic system. Damage to roads, buildings, and other structures occurred in the area between Mackay and Challis, west of the Lost River Range.

As much as 23 miles of surface ground rupture occurred along the western flank of the Lost River Range as a result of the main earthquake and aftershocks. During our exploration on the day of the earthquake we located about 12 miles of surface rupture. Fault

Curved fault scarp south of Dickey Peak. Note the fault scarp facing in the opposite direction at the base of the slope.

Fault scarp 9.8 feet high north of Birch Springs.

movement associated with the earthquake uplifted Borah Peak approximately 10 feet relative to the valley on the southwest side.

The surface fault trace is complex and comprised of multiple, gently curved, subparallel fault scarps extending along a trend of approximately N15W to N25W. The fault scarps we observed were located along the range front from near Elkhorn Creek northwestward to near Sheep Creek. The complex nature of the surface fault rupture can be clearly observed in the area immediately north of Birch Springs. Along this section of the mountain front, two to four scarps are visible. The maximum vertical offset measured on an individual scarp was as much as 10 feet. The main fault scarps dip from 70 degrees to near vertical and face westward toward the valley. At the base of the mountain front slope, a small down-dropped block or graben approximately 75 to 100 feet wide also formed. Offset along the multiple scarps has occurred in poorly sorted, unconsolidated, Quaternary gravels and other alluvial materials. Closely spaced, parallel tensional cracks are abundant over much of the 200-to-300-foot-wide fault zone north of Birch Creek.

A seismically induced landslide occurred at Birch Springs, within the zone of surface rupture produced by the earthquake. Seismic shaking from the earthquake produced ground failure and downslope movement of water saturated, slope-forming alluvial materials.

Soon after the earthquake, dramatic changes occurred to hydrologic systems in the Thousand Springs Valley and adjacent areas along the fault zone. Early reports of hydrologic effects included increases, decreases, or stoppage of well and spring flows. Reports also mentioned well water becoming murky or silty soon after the earthquake.

At Chilly Buttes, a northwest-trending fissure about 200 feet long was produced and a new cold spring formed on the east side of the northern butte. At 2:30 p.m. on October 28, a tremendous flow was issuing from the new spring causing extensive flooding in the valley to the east around the site of Chilly. In the valley floor a few hundred feet southeast of the new spring, sand boils (turbid upflows of water and sand) issued large volumes of water that added to the flooding. In the days following the earthquake, other reports of hydrologic modifications such as drying up of wells or alteration of water levels have been reported. A thermal spring south of Challis has reportedly stopped flowing.

The earthquake had significant immediate effects on the hydrologic system, land surface, and man-made structures. Further studies will assess long-range effects on resource uses in the area. ▽

Steve Moore and Dave Hovland are geologists in BLM's Idaho State Office, Boise.

Adopters Help Gain Balance

By Haywood Meeks

In its continuing struggle to protect wild, free-roaming horses and burros and the other resources of the land it manages, the Bureau of Land Management in fiscal year 1983 inched closer to its goal of balancing populations with the scarce forage and water available to them on BLM-managed public lands in the western States.

More than 5,000 excess wild horses and 1,600 wild burros were removed from the public lands during the fiscal year ending September 30. The greatest number of animals—2,521—were removed from rangelands in Nevada, which is home to more than half of all the wild horses in the United States. Removals in other States were: Wyoming, 1,726 animals; California, 1,199; Arizona, 587; Oregon, 330; Colorado, 194; Utah, 51; Idaho, 26; and Montana 24 animals.

There are presently about 49,000 wild horses and 11,000 wild burros using the public lands. BLM range specialists estimate the appropriate population level for effective management within a multiple-use environment is approximately 20,000 horses and 5,000 burros.

Since 1974, excess wild horses and burros removed from the public lands have been placed in private maintenance through BLM's Adopt-A-Horse program. More than 45,000 animals have been placed with individuals in every State except Hawaii.

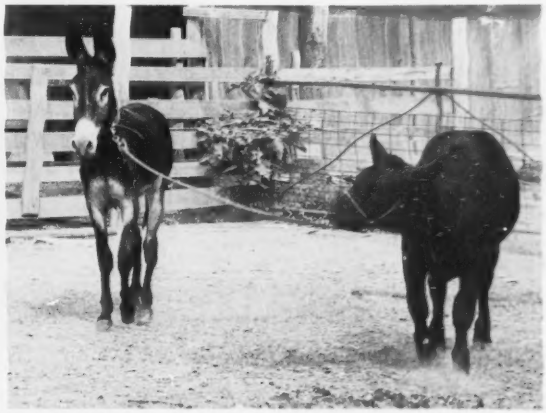
Approximately 5,000 animals were adopted in fiscal year 1983. To make animals more accessible to potential adopters, five contract adoption centers and four BLM-operated adoption centers located throughout the United States were in operation year-round. In addition, BLM operated 25 temporary adoption centers in Arizona, Arkansas, California, Mississippi, Ohio, Oregon, Washington and Wisconsin. Excess horses removed from the Little Book Cliffs and Pryor Mountain wild horse ranges in Colorado and Montana were adopted locally in those States.

Foster homes for excess wild horses and burros are found by the 12 State Offices of BLM. Most successful in finding homes in fiscal year 1983 was BLM's Eastern States Office in Alexandria, Virginia, which serves all the States bordering on and east of the Mississippi River. This office placed 1,514 animals with individuals. Second most successful was BLM's Wyoming State Office (which also serves Nebraska) with 1,155 animals; followed by New Mexico State Office, which found homes for 639 animals in New Mexico, Texas and Oklahoma. Next most successful was the California State Office, 557 animals; followed by Oregon, 475 Nevada, 322; Colorado, 234; Arizona, 76; Idaho, 61; Montana, 34; and Utah, 28 animals.

According to the 1971 Wild Free-Roaming Horse and Burro Act, wild horses and burros can

(Continued on page 23)

Wild horse herd management plans determine appropriate population levels to maintain ecological balance with other resource uses.



An adopted burro teaches a headstrong calf how to be guided by a halter in the show ring.

Lands for All Seasons (Even Winter!)

Velocity Peak on public lands near Silverton, Colorado is the site of the annual International Speed Skiing Championship. The event, sponsored by the Interanational Speed Skiing Association, was held at this site in 1981, 1982, and 1983. The 1984 contest is scheduled for April. Last year, speed records of 111 miles per hour for women and 126 miles per hour for men were set. The event is authorized through a special recreation permit issued to the City of Silverton.

Want to set a world speed record on skis?

Take on the snowbunnies at Sun Valley?

Try man versus machine on a snowmobile?

Bounce down a snow-covered slope on an innertube?

If such activities appeal to you, you may be surprised to learn that all can be enjoyed on a number of sites managed by the Bureau of Land Management (BLM).

Recreation on BLM public lands is a growing activity. In 1983, more than 56 million recreation visits were tallied. However, when public land recreation is mentioned, images brought to mind are often off-road vehicles in the desert kicking up sand, or backpackers hiking up rocky outcroppings, or weekend campers cooking hamburgers under the stars.

But the truth is, enjoyment of the public lands need not be confined to the warmer times of the year; for the hale and hearty, the fun begins when the lands are covered in snow. A few representative sites are shown here but many others are either frequently used or waiting to be discovered. They are part of the tremendous variety of recreation opportunities available on your public lands.

By Jan Bedrosian, public affairs specialist, Headquarters Office of Public Affairs, Washington, D.C.

Snow recreation areas on the public lands, such as the Hyatt Snow Play Area near Klamath Falls, Oregon and the Sand Ledges Winter Sports Area in Sevier County, Utah draw more and more visitors each year. The Sand Ledges area, consisting of a parking lot, tubing hill, fire circle, snowmobile trail and sanitary facilities, was built with help from the Youth Conservation Corps and draws 5,000 visitors annually. The Hyatt area includes a tubing hill with adjacent parking. It draws 6,000 visitors each year. ▼

The Sun Valley ski complex in Idaho draws 450,000 visitors a year. About 40 percent of the land involved in the complex, including the world famous Bald Mountain, is BLM land, with the rest national forest. The Sawtooth National Forest and BLM's Shoshone District have been cooperating in the management of the area since the early 1950's with the Forest Service handling the day-to-day administration of the permit, issued to the Sun Valley Company. The Federal government receives $250,000 annually for use of the area.

The Garnet Snowmobile Trail near Missoula, Montana is being considered for addition to the National Recreation Trail System. The 55 miles of trails (30 miles in the National Trail System proposal) are jointly managed under a cooperative agreement between BLM and the Montana Department of Fish, Wildlife and Parks. The Garnet Range Road is devoted exclusively to snowmobile use between January 1 and March 31, while other parts of the area are available to cross-country skiers. With careful management, conflicts between these often incompatible users has been minimal.

Adopters *(Continued)*

be maintained only in areas of the public lands where they were at the time of the Act's passage. Just how many, if any, will be maintained in an area is determined through BLM's land-use planning process. Several opportunities for the public to participate in this decisionmaking process are available.

Once a determination is made that wild horses or burros, as symbols of America's pioneer spirit, will be one of the multiple uses of land in a particular area, a comprehensive herd management area plan is developed. The plan details range conditions, current population levels of wild horses or burros, age and sex ratios, watering facilities, and forage available for the herd.

The herd plan also identifies specific improvements and facilities required to enhance the range used by the animals. For instance, some areas may need improved water sources, while others may require increased quantity or quality of vegetation, or both. Further, measures to prevent damage to the vegetation, soil and water resources may be necessary. Fencing may be needed to protect riparian areas or to inhibit movement of the herd onto adjacent lands being reseeded.

The herd plan also may call for efforts to maintain herd characteristics. This might mean maintaining horses or burros with certain markings, coloration or body configuration. In one herd area, horses with characteristics of the famed Tarpan horse — dorsal stripe, two-toned mane, grulla or dun coloring, and zebra markings on the legs — are being given special consideration.

Included in the herd plan is a statement of the desired population level to be maintained in an area, as well as a description of the actions necessary to maintain and protect the proper number of animals. Removal of excess horses or burros might be recommended to maintain a desired population level.

When excess horses and burros are removed, the healthy ones are offered to the public through the adoption program. Persons can get complete information from: Adopt-A-Horse, Consumer Information Center, Pueblo, Colorado 81009. ▽

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SERVICES PROVIDED BY THE BUREAU OF LAND MANAGEMENT

Since 1812, the Bureau of Land Management (BLM) and its predecessor agencies have provided a variety of services to the public. All land west of the first thirteen states was the original public domain. From it, most of the national forest, national park, and national wildlife refuge systems were created. The lands best suited for agriculture passed into private ownership. Congress provided major grants of land to states, colleges, and railroads.

All of the public lands remaining after such transfers are managed by BLM.

Managment of these public lands by BLM is decentralized to 12 state offices, which guide the management of the natural resources of the lands in 55 districts and their 154 resource areas.

Specific information about opportunities to enjoy the benefits of BLM lands and resources can best be obtained from the state office or district office responsible for the area of interest.

Most BLM lands are available for a wide variety of recreational activities, including sight seeing, picnicking, camping, hunting, fishing, watching wild horses and other wildlife, boating, skiing, and rock hounding. A map brochure called "Camping on the Public Lands," which lists principal recreation sites, is available from all BLM offices. Limitations on kinds, seasons, or areas of use apply in certain localities.

About 21,000 livestock operators pay grazing fees for the use of BLM rangelands, in accordance with permits and leases issued by district managers.

District managers sell about a billion board feet of timber annually in competitive auctions. Following harvest, the timberlands are promptly reforested and the new stands are carefully tended.

Minerals are made available for public use in several ways. Certain common minerals—like sand, gravel, and rock for road construction—are sold to the users at fair market values.

Locatable minerals—like gold, mercury, uranium, molybdenum, copper, etc.—can be claimed by filing a notice of location in the appropriate county and BLM state office, provided that the federal land is open to location and previous mining claims have not been filed. Records of mining claims are maintained by BLM state offices.

Leasable minerals—like oil, gas, coal, geothermal, nitrates of potassium and sodium, etc.—can be acquired by one of three methods, depending on the circumstance. Lands from which minerals may be extracted may be leased: (1) competitively; (2) over-the-counter on a first come, first served basis; or (3) if the lands have been leased previously, by drawings to select lessees from among those persons whose applications are considered to have been filed simultaneously. Regardless of the means by which a lease is acquired, royalty payments based on a percentage of the value of the mineral are paid as the mineral is extracted. Information about the availability of mineral leases can be obtained from BLM state offices.

The Federal Land Policy and Management Act of 1976 established the policy that BLM public lands are to be managed under principles of multiple use and sustained yield in accordance with resource management plans developed with public involvement. Harmonious and coordinated management of the various resources is designed to ensure the productivity of the land and the quality of the environment.

If as a result of land use planning, it is determined that certain parcels of land are surplus to federal needs, title to them may be transferred to other owners. Information about opportunities to purchase such lands may be obtained from BLM state offices. Generally, lands are competitively sold at not less than appraised values.

All Americans benefit either directly from the use of BLM lands and the resources they produce or indirectly from the resource revenues that go to the U.S. Treasury.

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT STATE OFFICES

ALASKA STATE OFFICE
Bureau of Land Management
701 C Street
P.O. Box 13
Anchorage, AK 99513

ARIZONA STATE OFFICE
Bureau of Land Management
2400 Valley Bank Center
Phoenix, AZ 85073

CALIFORNIA STATE OFFICE
Bureau of Land Management
Federal Building, Room E-2841
2800 Cottage Way
Sacramento, CA 95825

COLORADO STATE OFFICE (ALSO KANSAS)
Bureau of Land Management
1037 20th Street
Denver, CO 80202

EASTERN STATES OFFICE
(states bordering and east of Mississippi River)
Bureau of Land Management
350 South Pickett Street
Alexandria, VA 22304

IDAHO STATE OFFICE
Bureau of Land Management
3380 Americana Terrace
Boise, ID 83706

MONTANA STATE OFFICE (ALSO NORTH DAKOTA AND SOUTH DAKOTA)
Bureau of Land Management
222 N. 32nd Street
P.O. Box 36800
Billings, MT 59107

NEVADA STATE OFFICE
Bureau of Land Management
300 Booth Street
P.O. Box 12000
Reno, NV 89520

NEW MEXICO STATE OFFICE (ALSO OKLAHOMA AND TEXAS)
Bureau of Land Management
South Federal Place
P.O. Box 1449
Santa Fe, NW 87501

OREGON STATE OFFICE (ALSO WASHINGTON)
Bureau of Land Management
825 NE Multnomah Street
P.O. Box 2965
Portland, Oregon 97208

UTAH STATE OFFICE
Bureau of Land Management
136 East South Temple
Salt Lake City, UT 84111

WYOMING STATE OFFICE (ALSO NEBRASKA)
Bureau of Land Management
2515 Warren Avenue
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